PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

08/2002

DEVELOPMENT OF COMPREHENSIVE MONITORING TECHNIQUES TO VERIFY THE INTEGRITY OF GEOLOGICALLY SEQUESTERED CARBON DIOXIDE

PRIMARY PARTNERS

National Energy Technology Laboratory
Brookhaven National Laboratory
Los Alamos National Laboratory
Sandia National Laboratory
West Virginia University
OPHIR Corp.
Strata Production Company
Pecos Petroleum

DOE FUNDING PROFILE

Prior FY's	$319,000
FY2002	$400,000
Future FY	TBA

TOTAL ESTIMATED COST

DOE	$ 719,000

CUSTOMER SERVICE

800-553-7681

WEBSITE

www.netl.doe.gov

Background

One of the most critical research areas is aimed at monitoring the long-term storage stability and integrity of CO_2 in geologic formations. Research aimed at monitoring the integrity of CO_2 sequestered in geologic formations is certainly one of the most pressing areas of need if geologic sequestration is to become a significant factor in meeting this country's stated objectives to reduce greenhouse gas emissions. The most promising geologic formations currently under consideration for CO_2 sequestration are active and depleted oil and gas formations, brine formations, and deep, unmineable coal seams. Unfortunately, the long-term CO_2 storage capabilities of these formations are not well explored.

Primary Project Goal

The goal of this effort is to develop and demonstrate advanced monitoring techniques to assess the capacity, stability, rate of leakage, and permanence of CO_2 storage in geologic formations.

Objectives

- The primary objective is to evaluate a wide range of surface and near surface monitoring techniques that show promise in the detection of both the short term, rapid loss, and long-term, intermittent slow leakage of carbon dioxide from geologic formations.
- Monitor for carbon dioxide leakage at the West Pearl Queen Oil Field to ultimately determine the migration and fate of CO_2 after being injected into a depleted oil reservoir. Models and data developed will be used to predict physical and chemical changes in oil reservoir properties and the long-term storage capacity, safety, and integrity of oil reservoir sequestration.
- Monitor for carbon dioxide leakage at CO_2-ECBM/sequestration sites by conducting background studies of geophysical features, soil and atmosphere hydrocarbon patterns and concentrations, and monitoring locations and grid patterns for soil-gas sampling.
- Monitor with perfluorocarbon tracer compounds and evaluate tracer retention on coal.
- Perform geophysical site analysis from remote sensing and ground based measurements by combining satellite visible and infrared views with satellite radar and optical aerial photography.

Development of Comprehensive Monitoring Techniques to Verify the Integrity of Geologically Sequestered Carbon Dioxide

CONTACT POINTS

Curt White

Carbon Sequestration Science Focus Area Leader
National Energy Technology Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236

412-386-5808

curt.white@netl.doe.gov

Arthur Wells

Project Manager
National Energy Technology Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236

412-386-5975

arthur.wells@netl.doe.gov

Accomplishments

In previous years, work was completed on site selection for the initial field monitoring study. Agreements were made with various research agencies and state and federal environmental agencies to implement a monitoring program at the West Pearl Queen oil field site in southeast New Mexico where a carbon dioxide injection experiment will be conducted. An assessment of geological features at the New Mexico injection site was made from satellite images to aid in the placement of the chemical and optical monitors. Additionally, a contract was obtained for the services of the OPHIR Corp. to conduct a background survey of the atmospheric concentrations of CH_4, C_2H_6, and C_3H_8 at the injection well site, and surrounding area.

A group of novel tracer compounds was selected and the analytical protocol for their detection and quantification was decided upon.

A monitoring protocol was developed to maximize tracer detection. Techniques have been developed to sample soil gases for the tracers using an active gas sam-pling technique. A sampling pump was designed and several sampling systems were constructed at NETL. The protocol was evaluated at NETL prior to field-testing.

Benefits

Development of techniques to monitor the integrity of geologically sequestered CO_2 is needed to assure public health and safety and to gain public acceptance of geologic sequestration technology. Active and depleted oil and gas formations, brine formations, and deep coal seams that were previously unused now have the potential to serve as sinks for carbon dioxide sequestration. Additionally, by capturing carbon dioxide and sequestering it, harmful emissions into the atmosphere are prevented that may further increase global warming.

Spectroscopic Measurements – OPHIR Corp.
West Pearl Queen Field, New Mexico